Impediments to Traditional Logic

There are many impediments in the modern philosophical mind to an understanding of traditional or Aristotelian logic. These impediments would, of course, be considered errors by a defender of traditional logic. At any rate, they prevent us from understanding traditional logic as the traditional logicians themselves understood it. The removal of these impediments is not possible unless they are recognized. Our purpose here will be to enumerate these impediments in an orderly way, so that we can come to a full awareness of the difficulty of making a profound, or even a correct, approach to traditional logic in our time.

We have in mind impediments to the whole of logic. Impediments to the whole of a science, as distinguished from those that affect a part only, can pertain either to the end and purpose of that science, or to its subject, or to the proper method and way of learning it. Hence, our consideration of the impediments to traditional logic will be divided into three parts. The order is clear since the end is always most important in those things which are for the sake of an end, and the subject of a science is the proper principle for determining the method appropriate to that science. However, to make clear the nature of these impediments, we shall have to develop at some length many points about the subject and method of traditional logic. Our consideration of these points and of the impediments opposed to them should be considered no more than an *outline* of the problems facing those who would understand and defend traditional logic in our day. It goes without saying that such a brief outline will be of immediate use only to those who possess a deep knowledge of traditional logic through the great commentators on the *Organon* and the *Isagoge*. However, it is hoped that this outline will serve to guide and even stimulate traditional logicians to a deeper knowledge of their science and to a more adequate presentation and defense of it in the contemporary intellectual environment.

The most fundamental impediment to the end of traditional logic is found in those modern logicians who regard logic as worthy of being studied for its own sake. Logic was never admitted into theoretical philosophy by the traditional logicians, except as its *tool*.[1] A sign of this is that the logical works of Aristotle were given the Greek word for tool (*organon*) as their title.

The second impediment to the end of traditional logic is the opinion of those modern logicians who assert that logic has nothing to do with the acts of our reason in particular, because the latter

1. St. Thomas, *In Boetii De Trinitate*, q. V, a.1, ad 2.

belong to psychology. But the whole purpose of traditional logic was to direct the acts of our reason.[1] This does not mean, of course, that the acts of our reason were the subject of traditional logic. The relation of these two will become clear after we have considered the subject of traditional logic.

The third impediment to the end of traditional logic is the denial that logic is *intrinsically* ordered to acquiring knowledge of *things*, especially the knowledge of *what* a thing is, and *why* it is the way it is. An understanding of traditional logic cannot be cut off from all reference to things.[2] How could we understand a tool for knowing things without making any reference to things?

Perhaps the best way to approach the subject of traditional logic is through the acts which it directs. These acts must be in need of direction and must be dependent upon the same rules for their direction. The first clue to understanding the subject of traditional logic is to see that not all acts of our reason or intellect can be directed by the same rules. If we cannot reduce the direction of all the acts of our reason or intellect to the same rules, we must specify which acts are directed by traditional logic. This investigation is useful for the question of whether the new logic (whether we call it symbolical or mathematical or by some other name) is an extension of the old, or something more inclusive than the old, or something equivocally named logic. If the new logic considers other acts whose direction can be reduced to the same rules, or if the old logic can be reduced to more inclusive rules, then there will be indicated one answer to that question. If not, the answer will be different. We shall find, however, many impediments in the modern philosophical mind to the approach to the subject of traditional logic through the acts it directs.

We may divide all the acts of our intellect or reason into those of the theoretical intellect and those of the practical intellect. No one is apt to say that the direction of these two groups of acts can be reduced to the same rules; yet, let us examine this a bit from the beginning. The theoretical intellect and the practical intellect differ by their ends: the former considers knowledge or truth for its own sake while the latter applies or orders knowledge to making or doing something. But knowledge that we can act upon, must be based on a composition of means with an end actually desired, with no separation in the mind of all those things required in the actual making or doing. The theoretical intellect, however, seeks a distinct knowledge of the object by separating things joined in reality, such as a thing and its properties, or even the parts of a thing's definition.[3] Speculative

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1. St. Thomas, *In I Post. Anal.*, lect. 1.

2. "Logica ordinatur ad cognitionem de rebus sumendam." St. Thomas, *In I Peri Herm.*, lect. 2, n.13.

3. St. Thomas, *De Veritate*, q. 3, a.3.

definitions through genus and difference do not unite with a concrete end all the means required to achieve it in reality. It is difficult to see how we could reduce the direction of such diverse acts to the same rules. We can now turn to the more difficult question about the theoretical intellect alone.

Can the direction of all the acts of the theoretical intellect be reduced to the same rules? First, it would be well to note that not all acts of the theoretical intellect are in need of direction. Only those acts in which there is a *processus* or going forth from the known to the unknown (i.e., the acts of reason properly so called) would seem to be in need of direction. It would be impossible for our intellect to direct itself toward the very first notions that it requires. These fall into our intellect without any anticipation of them by our then empty intellect, and are the object of a knowledge more natural than subject to art. Since there are no other acts in the theoretical intellect than those by which we know or come to know (for the end here is simply knowledge), it remains to be seen if all acts by which we come to know something unknown from the known, can be directed by the same rules. If we come to know something but not in some way through what we know already, we have an act that is obviously not subject to direction by art. The acts in question, then, are those by which we proceed from the known to a knowledge of the unknown.

It might now be thought that we have come to the end of our investigation, for do not the traditional logicians speak of logic as directing our reason in proceeding from the known to the unknown. St. Albert, for example, in his *De Natura Logicae* (at the beginning of his commentary on the *Predicables*) says this over and over again. However, it is precisely here that the greatest difficulty is found. We might come to this difficulty by bringing in the position of a noted modern logician. Rudolf Carnap, in his *Foundations of Logic and Mathematics*,[1] seems to identify logic with "the rules of deduction"[2] and to make "calculation ... a special form of deduction applied to numerical expressions".[3] It is clear that acts of calculation (e.g., addition, subtraction, multiplication, division, etc.) make known some unknown number through ones that are already known. If traditional logic shows us in what way the unknown can be made known through what is already known, then it would seem that traditional logic must also direct calculation. Moreover, this is also seen in the fundamental act presupposed to calculation: numbering or, in general, measuring. For a measure, as the father of traditional logic himself says, is that by which quantity is made known.[4] Further, the act of

1. Rudolf CARNAP, *Foundations of Logic and Mathematics* in the series entitled Foundations of the Unity of Science, University of Chicago Press.

2. *Ibid.*, p.28.

3. *Ibid.*, p.1.

4. ARISTOTLE, *Metaph.*, Bk. 10, Ch. 1, 1052*b* 20.

counting or numbering is an act of reason which comes to know bit by bit rather than all at once (like an angelic intellect). Thus, both Aristotle and St. Thomas call numbering an act of reason in the fourth book of the *Physics*.[1] But the acts of reason are directed by logic.

On the other hand, the traditional logicians include neither numbering and measuring, nor acts of calculation among those three acts of reason which logic directs. Since counting and calculation are acts of the theoretical reason in that they are ordered to knowing, we cannot escape our dilemma by saying that the ancients would put them with the acts of the practical intellect which are definitely excluded from being directed by logic.

Why, then, did the traditional logicians exclude counting and calculation from the direction supplied by logic? The man who considers things from their beginning will get the clearest picture of them. Hence, we must consider calculation and those three acts of reason that are said to pertain to logic from the beginning. Since the third act of reason presupposes the second act and this, the first (for a justification of this, see St. Thomas' *Prooemium* to the *Posterior Analytics*), it is clear that logic in this sense must begin with the first act of reason which is to grasp what something is. Now, in calculation, the act which is presupposed to all others is the act of counting or measuring. Carnap himself notes this:

> Mathematical calculi with their customary interpretation are distinguished from elementary logical calculi chiefly by the occurrence of numerical expressions. There are two procedures in empirical science which lead to the application of numerical expressions: counting and measurement.[2]

Thus, the act of measuring or numbering is to all acts of calculation something like the act of grasping-what-something-is is to the second and third acts of reason. Not only does the first act of reason come before the second and third acts, but they are also in a way reduced to it. Obvious propositions, as the whole is greater than its part, can be seen when we have grasped what the parts are; in our example, what a whole is and what a part is. Propositions not obvious are proved most fully through demonstration whose middle term is a definition. Regardless of whether the operations of calculation can or cannot be reduced to that of measuring or numbering, we can now ask the fundamental question: can the act of measuring or numbering be reduced to that of grasping what a thing is, or vice-versa?

Although we can grasp what a measure is and what it is to measure something, it does not seem that we can reduce either of these two acts or operations to the other. Knowing *what* man is will not tell you

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1. See St. Thomas, *In IV Phys.*, lect. 23, n.628.
2. *Op. cit.*, p.44.

how many men there are in the world, nor will knowing *how many* men there are in the world enable you to know *what* man is. Or, again, knowing *what* water is will not tell you *how much* water is in the world, nor will knowing *how much* water is in the world enable you to grasp *what* water is.

Why is it that neither of these operations can be reduced to the other in the way that the second and third acts of reason can be reduced to the *quod quid erat esse*? Well, if any one could be reduced to the other, it would seem that the act of measuring or numbering could be reduced to that of grasping what a thing is. For the latter is the fundamental and defining operation of intellect as such. Moreover, even now we can grasp *what* a measure is and define it; and likewise, we can grasp what it is to measure a thing or a multitude. But, since we grasp or understand what something is *by abstraction from that whereby it is measurable*; i.e., from that whereby it is multiplied numerically or extended part outside of part; we cannot, through our grasp of what a thing is, attain the measurable multitude or quantity of it. If, however, there is an intellect which understands what things are without making such abstraction, it can attain their multiplicity or quantity through the same knowledge. From this, we can see why a science based on measurement, as experimental physics, could insist on our not knowing the essence of anything.

Can we conclude that the direction of the three acts of reason (simple grasping, composition or division, and reasoning) and that of counting and calculation cannot be reduced to the same rules or principles, because the most basic acts in both cannot be reduced to one another? Perhaps, it will be objected immediately that there is already implied in our discussion a rule or principle common to both. This is the principle that we should proceed from the known to the unknown. It is true that this principle extends to every proceeding from one thing to another in our theoretical intellect and even to the proceeding from sense to intellect. It is to be observed, in the proper way of proceeding in each science and in our proceeding from one science to another. In short, it directs the whole proceeding of our theoretical reason. In this way, there is a principle or rule common to both.

But what kind of a principle is this? It is an extremely common principle. In fact, as the principle of non-contradiction is to the conclusion (and even the premises) of all sciences; so the principle of going from the known to the unknown is to every way of proceeding in our theoretical intellect, and also to the passage from sense to intellect. But the unity which all science have in the principle of non-contradiction does not destroy the multiplicity of sciences which is based on the diverse proper principles of their demonstrations. Hence, the dependence of every way of proceeding on this most common principle of going from the known to the unknown is not

sufficient to say that there is one science or art or *paideia* to direct us in every way of proceeding.

This solution is difficult and another likeness will help. We say that the proper way of proceeding in each science is determined by the subject of that science and the relation of our reason to that subject. Thus, the proper principles by which the proper or special ways of proceeding are determined are always distinct, since their subjects are always distinct. But suppose someone should say that the proper ways of proceeding in the sciences are all determined by the same principle — the general one stated at the beginning of this paragraph. We cannot deny that the determinations of these proper ways of proceeding depend upon this very common principle. Yet the proper principles of these determinations — the diverse subjects of the sciences and the diverse relations of our reason to them — are not the same. This common principle by itself cannot determine any proper way of proceeding. Rather, every proper or special way of proceeding is determined by its own principles. Hence, if we find that the *proper* principles of directing the three acts of reason are diverse from those for directing counting and calculation, we shall not expect to find one science or art to direct both. We would expect the proper principles to be diverse since they would have to be proportioned to or adapted to acts (grasping what a thing is and counting) that are not reducible to each other or to any more basic act. In fact, as we shall see later, the direction of the three acts of reason requires the finding of certain relations, called second intentions, based on things understood in the state of being understood. Hence, any other acts whose direction does not require the finding or discovery of such relations cannot pertain to the same art or logic. But the acts of calculation do not require the finding of such relations. Therefore, they cannot belong to the same art to direct. Moreover, the direction afforded by traditional logic *cannot* be separated from words even though words are not its principal consideration. This is seen in the great writers in traditional logic. But according to George Boole, one of the fathers of the new logic, "Language is an instrument of Logic, but not an indispensable instrument."[1] This direct contradiction is a sufficient sign that the word *logic* is equivocal here and that direction is not being reduced to the same principles.

It is illuminating to recall that the new logic is intimately associated with the progress of the modern mathematical sciences of nature. But as the late Charles de Koninck so well pointed out, "it has lately become obvious that the giant strides in the mathematical study of nature are concomitant with a gradual emancipation from

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1. George Boole, *The Mathematical Analysis of Logic*, Barnes and Noble, Inc., p.81.

the use of words."[1] This is a sign that a logic tied up with such a science will be a logic in a quite different sense of the word from the traditional one. Although the new logic can do things that the old cannot, it cannot replace the old. It has, rather, a kind of dependence on the former in that "The mathematician and the mathematical physicist are only hampered by the use of words while pursuing their type of knowledge but, when they want to convey what their knowledge is about, it seem that they must use them."[2] The old logic, then, always keeps a priority over the new in that the former is used in discussing itself and the new while the new can neither discuss itself, nor the old. It should be understood that, by the *new logic*, we mean symbolic or mathematical logic insofar as they are not a mere continuation of the old. Aristotle certainly did not complete traditional logic, but merely its principal parts, as Ammonius explains at the beginning of his commentary on the *Peri Hermeneias*.

We can disengage now the impediments in the modern philosophical mind to an approach to the subject of traditional logic by the acts that it directs. These impediments are general ones, and we shall meet them often again. There is first of all a confusion in the modern philosophical mind between common and proper principles or, more appropriately, between common rules and proper rules. This ancient distinction is not too difficult to see in the case of the mechanical or practical arts. "Make things out of a matter which is suitable to their end or purpose" is a common rule in all the mechanical or practical arts. But the existence of this very common rule does not make one art out of carpentry and the art of glassblowing, because the ways in which things are made out of wood and out of glass are not the same. The proper principles or rules of carpentry show us how to make something out of wood, and the proper rules of glassblowing, out of glass. These proper rules are different because they must be adapted to materials that cannot be worked in the same way. Similarly, rules, such as we should go from the known to the unknown, or that one thing should follow necessarily from another, are entirely too general to constitute a single art for the acts of calculation and the three acts of reason of traditional logic. The proper principles or rules adapted to each set of acts are entirely distinct. This is not, however, to deny all similarity between these two sets of acts. And this brings us to another general impediment.

The modern philosophical mind is not at all habituated to distinguish the kind of likeness that is found in the matter or subject of a science from the kind of likeness that is useful only for leading the student by the hand to see some difficult point. Aristotle was very

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1. "Random Reflections on Science and Calculation," *Laval théologique et philosophique*, Vol. XII, 1956, n° 1, p.85.

2. De Koninck, *op. cit.*, p.88.

much aware of the likeness between the acts considered in logic and the acts of calculation. Two examples will suffice for the moment. When naming the *syllogism*, Aristotle was obviously making use of a likeness between the logical act using this instrument and the more known act of reckoning or calculating. This is clear to anyone who looks up the Greek word συλλογισμός. Another example of Aristotle's awareness of this similarity is seen in the comparison he makes between those deceived by sophistical arguments and those deceived in the marketplace by experts in managing counting machines.[1] Thus, although he saw this similarity or likeness, Aristotle made no attempt to unite the art of calculation with logic. The reason for this is that he realized that not just any similarity or likeness is sufficient to have one science or art. If this latter were true, there would not only be one science of the three acts of logic and the acts of calculation, but we would also have to include the acts of the practical intellect, and even those of nature. Dialectic, for example, is in some way like counsel, and St. Thomas can compare the third act of reason to the acts of nature.[2] Moreover, there is a likeness which falls below even that which is suitable for leading the student by the hand. Such is the likeness of the metaphor. That the likeness between the acts of calculation and the three acts of traditional logic is not sufficient to found one science has been partly shown above when it was pointed out that the most basic acts in these two sets cannot be reduced to each other, nor to a common act. It can be seen more clearly, too, after we have considered the basis for the rules of traditional logic.

Since the third act of reason depends on the second, and the second, on the first, and since the first is ordered to the second and the second, to the third, it does not make sense to reduce the direction of these three acts to different arts or sciences. Hence, there is one art or science which directs us in these three acts so that we may proceed orderly, easily, and without error in them. This art must contain *rules* by which that direction is made possible. Our next question, then, is "What are those rules based upon?" It is precisely here that we enter into the great subtlety and difficulty of traditional logic. The basis for these rules cannot be understood apart from the doctrine of the great traditional logicians so well summarized in the following passage:

Alius autem est ordo, quem ratio considerando facit in proprio actu, puta cum ordinat conceptus suos adinvicem, et signa conceptuum, quia sunt voces significativae ... Ordo autem quem ratio considerando facit in proprio actu, pertinet *ad rationalem philosophiam*, cuius est considerare

1. *On Soph. Ref.*, Ch. 1, 165*a* 6-18.
2. *In I Post. Anal.*, lect. 1, n.5.

ordinem partium orationis adinvicem et ordinem principiorum adinvicem et ad conclusiones.[1]

We cannot think about things without forming thoughts (however vague or distinct) about them, nor can we express these thoughts well to ourselves or to others without using words to signify them. Hence, we cannot think orderly about things without putting order into our thoughts and into the words that signify those thoughts. But the passage above indicates more than this. It suggests that the order in our thoughts and the order in the words which are signs of those thoughts are in some way the cause of order in our thinking.

We must consider more carefully this strange dependence of the act of reason upon the term it produces. We can show the existence of this dependence by an induction. Why do we form definitions? So that we may know distinctly what things are (in the case of definition in the strict sense). If we could know this without definitions, we would not form them. Why do we form enunciations? So that we can know the true and the false. We do not seem to be able to know the true or the false except in the enunciation where they are found. Why do we form syllogisms? Because we cannot know certain propositions without so doing. Thus, we define demonstration as a *syllogismus faciens scire*, etc.

That this dependence of the act of reason upon the term it produces is a strange one can be seen when we ask what kind of dependence is here involved; i.e., to which of the four genera of causes should we reduce it? Although we have used the word *making* (*faciens*) above, this need not indicate the agent cause. The word *making* is carried over to the other causes; e.g., the virtue of a man makes him to be virtuous, formally speaking. Since the acts produce the concepts, we can hardly consider the dependence of the acts upon the concepts as being in the genus of agent cause. Nor can the dependence of the acts upon the concepts refer to cause in the sense of end or purpose, for the act is always the end of the concept produced; we form definitions for the sake of knowing distinctly what a thing is. Hence, as a corollary, the act of thinking cannot be classified as a productive act essentially, since the end of the latter is always the thing produced. Finally, it is manifest that the term of the act is not the matter of the act, that out of which the act is made. It remains to put the dependence of the act upon the term produced in the genus of formal cause. Indeed, if knowing is defined as becoming other as other, which the concept produced makes possible, then the dependence would seem to be on that which completes the definition — the formal cause. Since the concept is a cause *per modum objecti*, we might consider it an extrinsic formal cause.

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1. St. Thomas, *In I Ethic.*, lect. 1, nn.1-2.

This kind of cause is very strange and difficult to understand, so that some *manuductio* is in order. The best that we can come up with is the following. The order in our concepts or thoughts can be compared to the order in a magnitude such as a road; and our thinking can be compared to the movement over this magnitude, or along this road. Hence, just as the order, or the before and after in the road is a cause of the before and after in the movement over its length; so the order in our thoughts is a cause of order in our thinking of them. But the order and the continuity in the road can only be an extrinsic formal cause of the order and continuity in the movement over it. Likewise, the same will be true of the order in our thoughts to the order in our thinking. This likeness, which is drawn from the sixth book of the *Physics*, was seen by Aristotle who carried over the word *road* from sensible things to logic.

The above text would also seem to indicate that we cannot put order into our thoughts or concepts without putting order into the words that signify those thoughts. This interpretation of traditional logic is confirmed by the way in which the consideration of words was regarded as necessary in that logic. The student, of course, has a special dependence on the order of his teacher's words.

Logic, in the above text, was seen to be tied in with the dependence of the acts of reason upon the terms produced by them. Logic must help our reason in the formation of definitions, enunciations, syllogisms, etc., and, after their formation, in the judgment of their goodness or badness. But, in what way does logic help reason in these formations, or in what way is logic a *cause* of these formations? In the above text, St. Thomas speaks of *reason* as making, but to *logic* he attributes only consideration of the order in our thoughts and words. Can we also speak of logic as making definitions, etc.? It might seem so since we call logic an art. Moreover, is not logic a tool of reason in the formation of definitions, etc., as the title of Aristotle's logical works indicates? But a tool is in the genus of agent cause. We would answer that logic does indeed help reason in the formation of divisions, definitions, enunciations, syllogisms, etc. But it helps reason, not in the way that a hammer and saw help a carpenter make a chair, but more in the way that a blueprint helps the carpenter. This second way is reduced to the genus of formal cause — extrinsic formal cause or exemplar — rather than to agent cause. When logic is called a tool or an art, this is a very broad sense of those words. A tool here means anything by which we make in any sense whatever. Directions can in this sense be considered a tool. Art means any *ordinatio* by which human acts arrive at their end through determinate means. Logic is a cause of the formation of divisions, definitions, etc., insofar as it gives rules to be observed in their formation.

We must next investigate the nature of the rules that belong to logic. The fundamental question here is whether those rules are

discovered or invented by our reason. This question is tied in with another: what composes these rules? It should not remain hidden to us, that rules invented by reason need not be arbitrary. They can be suitable to a given end and consistent with one another, as are the rules of baseball or football. We call rules *invented* because either the end of them is chosen by us (rather than exists by nature), or the end does not necessarily require those rules, or for both of these reasons. When both an end and the rules for directing us to that end are not subject to our choice, but are determined by our nature, then we have rules that are not invented, but which can only be found or discovered.

Rudolf Carnap speaks of the rules of logic as invented in the above sense. Let us quote his own summary:

> The result of our discussion is the following: logic or the rules of deduction (in our terminology, the syntactical rules of transformation) can be chosen arbitrarily and hence are conventional if they are taken as the basis of the construction of the language system and if the interpretation of the system is later superimposed. On the other hand, a system of logic is not a matter of choice, but either right or wrong, if an interpretation of the logical signs is given in advance. But even here, conventions are of fundamental importance; for the basis on which logic is constructed: namely, the interpretation of the logical signs (e.g., by a determination of truth conditions) can be freely chosen.[1]

Regardless of what the word *logic* may refer to in Carnap's vocabulary, it is our belief that the word was used in traditional logic for something whose rules had a basis that could not be chosen. These rules arise necessarily in the scientific consideration of the subject of logic. This subject is necessarily rooted in our natural (and, hence, not subject to choice) way of understanding by way of abstraction, by going from the confused to the distinct, etc. (A good summary of these elements in our way of understanding is given by St. Thomas in the *Prima Pars*, q.85.) Hence, it would be a most serious impediment to traditional logic to believe that its rules were chosen or invented. However, we should not infer that traditional logic was based on psychology as such, for the rules of logic are expressed with second intentions which are not part of the subject of psychology. Of course, psychology cannot be irrelevant to an art that directs the three acts of reason. Yet it (psychology) does not supply the proper principles of logic which are, as we have said, second intentions.

It is now time to move to a consideration of second intentions (and the impediments opposed to them) which we have purposively left until this point. We can arrive at second intentions by dividing them from other relations. This text is useful for that purpose:

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1. *Foundations of Logic and Mathematics* above, p.28.

Dicendum quod sicut realis relatio consistit in ordine rei ad rem, ita relatio rationis consistit in ordine intellectuum; quod quidem dupliciter potest contingere: *uno modo* secundum quod iste ordo est adinventus per intellectum, et attributus ei quod relative dicitur; et huiusmodi sunt relationes quae attribuuntur ab intellectu rebus intellectis, prout sunt intellectae, sicut relatio generis et speciei: has enim relationes ratio adinvenit considerando ordinem eius quod est in intellectu ad res quae sunt extra, vel etiam ordinem intellectuum ad invicem.

Alio modo secundum quod huiusmodi relationes consequuntur modum intelligendi, videlicet quod intellectus intelligit aliquid in ordine ad aliud; licet illum ordinem intellectus non adinveniat, sed magis ex quadam necessitate consequatur modum intelligendi. Et huiusmodi relationes intellectus non attribuit ei quod est in intellectu, sed ei quod est in re.[1]

This text throws light upon the question we just answered. The rules of logic involve relations such as genus and species — the first of the two kinds of relation considered in this text. These relations are found by reason in considering the order of what is in the intellect to things which are outside the intellect, and also the order of things understood to each other. Such considerations are not the business of psychology. These relations, which belong to things understood in the state of being understood, cannot be separated from them in that state. But it is precisely in this way that logic is concerned with things. Therefore, the rules of logic must involve these relations. It is these relations that were called second intentions by the traditional logicians.

But a number of serious questions can be raised here about the position of the traditional logicians. Why should our thinking be directed by rules that involve the relations that belong to things understood in the state of being understood? This is really very strange, no matter how many times we may have heard it. Is it not better to base our thinking on what belongs to things understood, considered in themselves, rather than on what is extrinsic to them (as is what belongs to them in the state of being understood)?

Two things must be pointed out in answer to this question. One is that traditional logic itself maintains that demonstration is more perfect than dialectic. Demonstration must proceed from the proper *per se* principles of the thing while dialectic proceeds from second intentions which are extrinsic to the thing. But this does not mean that the part of logic which considers demonstration is based on the proper *per se* principles of each thing about which we can demonstrate some property. Logic would then have to be every science. Rather, this part of logic considers those second intentions or relations which the proper principles of a thing must have in the intellect when we demonstrate. Another thing that should be pointed out is that the direction of our thinking is not entirely reduced to the

1. St. Thomas, *De Potentia*, q. 7, a.11, c.

rules of logic. Logic is only the common way of proceeding in the sciences. Each science requires, in addition to logic, the direction which is supplied by its own proper or special way of proceeding. The latter is based, as we saw before, on the subject of that science considered in itself and upon the particular relation of our reason to that subject. The direction of our thinking in any given science, then, is dependent both on logic and on that science's proper method. Hence, although these two ways of proceeding are not based on the same proper and immediate principles, it would be absurd to ask which set of principles is the correct basis for the rules to direct our thinking. To make a choice between them would amount to rejecting part of what is necessary for the direction of our thinking. What is important to see about logic is both its necessity for the direction of our thinking in the sciences, and its insufficiency for that direction without the proper ways of proceeding. It is, of course, much easier to see the insufficiency of logic than it is to see its necessity. It is with the latter point, then, that we must be especially concerned.

The necessity of logic has already been touched upon before. If we cannot think about things without forming thoughts about them, we cannot think orderly (or with direction) about them without putting order into our thoughts. Since we express things as we understand them in our thoughts, we cannot put order into our thoughts without knowing the order which things understood have in this state to what is outside the mind or to each other. But it is this latter which logic considers. It is a matter of experience that this order is rarely or imperfectly found by those ignorant of logic.

We have shown that the thing referred to by the word *logic* as used by the traditional logicians is involved in the dependence of the acts of our reason upon their terms. For the sake of completeness, and because some people think that the traditional logicians confused logic with psychology, we must inquire whether logic is involved in the dependence of our thinking or acts of reason, upon their principles: the intellect itself, the intelligible species abstracted from the phantasms, and the intellectual habits such as the sciences. Logic does not seem to be a cause of the intellect for obvious reasons. Nor does it seem to be a cause of the intelligible species coming to be in the possible intellect. The agent intellect and the phantasms are the cause of this, although in different ways. Hence, logic without experience is useless. Since habits are produced by acts, logic is a cause of intellectual habits only insofar as it is a cause of the acts. It is a cause of the acts only insofar as it prescribes the order which should be in our thoughts and in the words signifying those thoughts.

Before we proceed to determine more exactly the subject of logic, we should consider the question why these relations which belong to things understood in the state of being understood are called second

intentions. This question is answered well by Cajetan in his commentary on the *Isagoge* of Porphyry:

> Intentio idem sonat quod attentio; et dividitur in primam et secundam. Cuius divisionis ratio sumitur ex eo quod rei, quae intelligitur, dupliciter aliqua conveniunt: Quaedam conveniunt ei etiam si nunquam intellectui praesentaretur, ut homini convenit esse risibilem et altum et huiusmodi, et quaedam conveniunt illi rei nonnisi ex hoc quod intellectui praesentetur vel ex hoc, quod circa illam intellectus negotiatur, ut homini convenit, quod sit subjectum vel praedicatum in aliqua propositione et huiusmodi; haec enim et similia non inveniuntur in homine in rerum natura existente, sed tantum in eo ut in intellectu est. Ex his itaque ... sciendum est, quod prima intentio vocatur illa intellectus attentio, qua inspicit in rebus sibi oblatis ea, quae conveniunt illis in rerum natura. Secunda autem intentio dicitur illa intellectus attentio, qua in rebus sibi oblatis intuetur ea, quae conveniunt illis ex intellectus adinventione. Verum, quia occultiora ex notioribus nominamus, et id, quod secunda intentione concipitur, debilissimae entitatis est, extensum est intentionis vocabulum ad id, cui attenditur et vocatur secunda intentio id, quod intellectus concipit secunda attentione ...[1]

It is worth noting in this naming process that we go from the act to the second intention. We shall see the universal significance of this when we come to talk about *manuductio* later in this article.

Next, we must consider the subject of logic which is said to be second intentions. And since according to the third tool of dialectic, it is useful to consider the difference between things that are close together, we will compare logic with mathematics which is also about intentional beings and with metaphysics, insofar as it can also consider second intentions.

Although both logic and mathematics consider intentional being (which is why certain moderns have either identified the two or attempted to reduce one to the other), there are many important differences between them. First, the subject of logic is second intentions, while that of mathematics is first intentions. A second important difference is that the logician *finds* his subject as a result of our way of knowing by abstraction, etc., while the mathematician *makes* his as we can see in the operational demonstrations of geometry. In this respect, the grammarian who finds his subject is more like the logician than the mathematician. From this follows a third difference: although both logic and mathematics (in the sense of Euclid's *Elements*, of course, not calculation) are properly sciences, the latter has more the notion of art than the former, in that construction enters the very act of knowing there (as can be seen in the ninth book of the *Metaphysics* of Aristotle) which it does not do in logic. Both mathematics and logic

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1. *Comm. in Porphyrii Isagogen Ad Praedicamenta Aristotelis*, Angelicum Edition, 1934, pp.18-19.

are called arts only *communiter loquendo* when we distinguish them from the other sciences. There are, of course, other speculative arts, such as grammar. A fourth and most illuminating difference is suggested by these words of St. Albert:

> Quamvis enim logicus intentiones rerum considerat, et non res: principaliter tamen logicus intentiones considerat relatas ad res: et sic considerat res stantes sub intentionibus quas considerat.[1]

But the mathematician does not consider his intentions *relatas ad res* even if they can be applied later to sensible things; e.g., the geometer as such does not consider whether his triangle is in things or how it is applicable to them.

This fourth difference is clarified by the difference between logic and metaphysics, when the latter considers second intentions. It is not enough to say that logic has second intentions for its subject; we must also add in what way. The same thing must be done here as is done in the case of the mathematical sciences. Their subject is not adequately described by saying *quantity*, for the metaphysician also considers quantity. We have to add in what way the mathematician considers quantity. So too, we must here precise the way in which the logician considers his relations or second intentions, since the metaphysician also considers them. The metaphysician considers the kind of being that second intentions have, while the logician must consider them in some special way — otherwise, logic would not be a distinct science from metaphysics. The best answer we have found to this rarely discussed question is that reported from Avicenna by Cajetan in his commentary on the *Isagoge*. Logic is

> de secundis intentionibus non absolute, ut entia sunt, quoniam huiusmodi metaphysicae speculationis est, sed adiunctis primis, idest, ut fundantur in primis et denominant eas, ita ut, per earum applicationem, rerum, quae primis attentionibus asseruntur, cognitio habeatur.[2]

This way of defining in logic can be seen in all its definitions. The definition of genus, for example, denominates animal, etc.; for animal is said of many differing in species in answer to the question "What is it?" The definition of genus is a definition of a secund intention, not as a kind of being or as a certain type of *ens rationis*, but as it denominates first intentions which in turn express things. It is also easy to see that this position of Cajetan and Avicenna is in agreement with that of St. Albert above. Logic could not consider intentions principally as related to things if it did not consider them as denominating first intentions which express things.

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1. *Comm. in Priora Analytica*, Bk II, Les Presses de l'Université Laval, 1952, pp. 164*b*-165*a*.

2. CAJETAN, *op. cit.*, p.24.

This way of considering second intentions is in accordance with, and follows from the traditional conception of logic as a *tool* of the sciences. The subject of logic is not defined as if it were studied for its own sake; rather it is defined for the sake of knowing things. In fact, its subject comes into existence as a result of our reason's attempt to know things. That is why the discovery of these relations is given by St. Thomas in this order, in the text quoted above: "has enim relationes ratio adinvenit considerando ordinem eius quod est in intellectu ad res quae sunt extra, vel etiam ordinem intellectuum ad invicem." The order to things is first, just as the order of things to their end is before their order to each other.

The end of knowing things is so important in logic that we put it into the very definitions; e.g., we define definition in terms of knowing what a thing is, or enunciation in terms of truth or falsehood, and demonstration in terms of our knowing the cause of a thing's property belonging to it. But to return for a moment to the fourth difference above between logic and mathematics: the figures which the geometer constructs in his abstract quantity are not considered as founded in sensible things or as denominating them so that we may have a knowledge of sensible things through them. And, of course, end or purpose enters neither the definitions, nor the demonstrations of mathematics.

It was necessary to explain at some length the subject of traditional logic so that the impediments to understanding it could be seen more clearly. The first impediment can be stated in three degrees, because it is found in a more or less radical form in different thinkers. This impediment prevents us from seeing the kind of relations that second intentions are. The most radical form of this impediment is found in those thinkers who believe that all we know about things is what we find to belong to them in our knowing powers. If things in themselves are unknowable, it becomes difficult or impossible to distinguish the relations that belong to things understood in the state of being understood (i.e., the second intentions) from the relations that belong to them in reality or in their proper natures. The second, less general degree of this impediment, is found in those who assert that every *sensible per accidens* (among which are sensible substances and *some* relations) is made in the mind or exists only in the mind. The third degree of this impediment is the belief that all relations are beings of reason only. Since all relations are known as such only by reason, many thinkers believe that no relations are in the division of real being. If a thinker cannot even distinguish between real relations and relations of reason, he will hardly arrive at the particular kind of relation of reason that is the subject of logic. Since even real relations have so little being, it is easy to fall into this position.

Closely related to the foregoing impediment is one that consists in the belief that logic is the most general study possible of structure

and relation. The explanation of the word *logic* in this belief would be based on the property of reason which is to consider the order or relation of one thing to another. Since the word *logic* is derived from *logos*, which in Greek means *reason*, it would stand for the most general possible consideration of order or relation. This impediment compounds all the previous ones. It attempts to combine in one science relations that have only a likeness sufficient for *manuductio*, not for definition or demonstration. There is, for example, a likeness between the logical relation of genus to species and the biological relation of a father to his son. Porphyry makes good use of this likeness as a *manuductio* in his *Isagoge*, but he does not attempt to make these two relations fall under the subject of one science. One can see many similarities between these two relations that help to manifest something about genus and species through the more known relations of father and son. Thus, for example, as the same man can be both a father and a son at the same time, but only in reference to different persons, so the same thing can be both a genus and a species, but only in reference to different things. But this sort of likeness does not enable one to put them in the same science. The scientific consideration of order or relation belongs to the science which considers the proper cause, or foundation, or subject of that relation. The relation of father to son has its foundation in the act of generation, which is considered in natural science. Other relations are founded on quantity, such as those considered in geometry or the science of numbers. Yet other relations are based on acts of will which are considered in moral science. There are still other kinds of relation based on other subjects, but logic (if it is a science) can consider only those relations which are based on things understood in the state of being understood. This is why the universal, and predicability which follows upon it, are the first things considered in traditional logic. This brings us to a third impediment to understanding the subject of traditional logic.

We saw above that the logician considers second intentions *as they denominate first intentions* and, hence, *as they are useful for knowing things*. This agrees with the end of logic; i.e., with its being a *tool* rather something to be studied for its own sake. But for many modern thinkers, logic is no more a tool than is pure mathematics for the middle sciences. Although pure mathematics can be applied to natural phenomena, it can still be studied for its own sake. Pure mathematics is not intrinsically a tool. But traditional logic was always regarded as being intrinsically a tool. Hence, the subject of logic cannot be regarded as separated from first intentions or from things in the way that the subject of pure mathematics is separated from sensible or natural phenomena. But this is precisely how some modern logicians regard it. This, then, is a most serious impediment to recognizing the subject of traditional logic. We can see how it also includes the impediment from the end. We shall now pass to a consideration of

the impediments concerning the special method or way of proceeding in logic.

The consideration of the method of a science appropriately follows a determination of its subject, since the method of a science must be determined in conformity to the subject of that science and the relation of our mind to that subject. In the remainder of this article, we wish to note impediments to three extremely important elements in the special method of acquiring logic. The consideration hitherto given to this proper method does not seem to us to be at all commensurate to its importance. (Nor will our consideration give due justice to it.) Perhaps this is due to the fact that our attention is usually riveted to logic's role with respect to the other sciences or with respect to all the sciences. However, this should only make us more aware of the importance of logic's proper method. The latter has a double importance: one due to the general fact that the proper method of any science is a universal principle of that science, and the second due to the fact that the science here in consideration is a universal principle of all the sciences, treating as it does their common way of proceeding.

We shall consider three elements in the proper or special method of acquiring logic and the impediments opposed to them. The three elements are the term to which judgments in logic resolve, the *manuductio* appropriate to its subject, and the order of determination, especially as regards its first part. The importance of the first of these elements is shown by the fact that judgment is the most essential act in science or, rather, the act that completes or defines science. The importance of the second element can be seen, in general, from the fact that St. Thomas puts it even before the proposing of the order of principles to their conclusions as the work of a teacher in communicating a science.[1] We shall consider the term of resolution in logic first because it will illuminate one of the reasons why *manuductio* in logic is so crucial. The importance of the order of determination is indicated by its presence in the introduction to traditional logic.[2]

It is not easy to imagine a more disastrous error about the method of a science than to make a mistake about the term to which its judgments resolve. Science, in the strictest sense of the word, is defined in terms of resolution. The two treatises of Aristotle in logic dealing with science take their names from the Greek word for resolution. Some attention to this subject has been paid in regard to the three speculative or theoretical sciences; i.e., natural science, mathematics, and metaphysics. This is perhaps due to our possession of Boethius' masterful treatment of the terms of resolution in these three sciences. But there seems to be a surprising neglect of the question in regard

1. *Ia*, q. 117, a.1, c.

2. See, for example, St. Thomas, *In I Post. Anal.*, lect. 1.

to the science of logic. Yet the importance of such a consideration would be hard to overestimate, because the whole of logic depends upon it and all other sciences depend upon logic. There is hardly a problem or misunderstanding about any of the parts of traditional logic whose solution or correction does not involve an understanding of the term to which the judgments of that science resolve. And, it is certain that no profound understanding of traditional logic is possible to anyone ignorant of the same. In what follows, we shall attempt to show briefly the term to which the judgments of logic should resolve and, secondly, to illustrate a bit its indispensable role in an understanding of the parts of logic. In so doing, we shall have opportunity to note impediments to logic.

All of the elements of the proper method of a science are dictated by the subject of that science and the relation of our mind to that subject. If that famous answer is correct which states that the subject of logic is second intentions, then there would seem to be dictated a certain term to which the judgments of logic must resolve. Since second intentions are relations which reason finds in things understood in the very state of being understood, the term of resolution in logic cannot be sense as in natural science, nor imagination as in mathematics, but only the reason or intellect itself. This is also shown by the relation of our reason to that subject. Our reason is able to consider this subject due to its (reason's) ability to reflect upon itself.

The indispensable role of this term of resolution can be illustrated in the very beginning of logic. St. Albert is reflecting, we believe, the tradition in logic that begins with Aristotle and flows down through three great groups of commentators when he says that the first thing to be considered in logic is the universal: "Primum autem quod in scientia logica considerandum est, universale est."[1] Indeed, if a thing is singular when sensed and universal when understood, then logic, which considers those relations which belong to things understood in the state of being understood, must begin with some understanding of the universal. The impossibility of understanding this without resolving to the intellect is well shown in the following passage from the *Parmenides* of Plato. Parmenides is questioning Socrates:

'But I should like to know whether you mean that there are certain ideas of which all other things partake, and from which they derive their names; that similars, for example, become similar, because they partake of similarity, and great things become great because they partake of greatness; and that just and beautiful things become just and beautiful because they partake of justice and beauty?'

'Yes, certainly,' said Socrates, 'that is my meaning.'

'Then each individual partakes either of the whole of the idea or else of a part of the idea? Can there be any other mode of participation?'

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1. *De Praedicabilibus*, Tract II, Ch. 1, Les Presses de l'Université Laval, 1957, p.23.

'There cannot be,' he said.

'Then do you think that the whole idea, is one, and yet, being one, is in each of the many?'

'Why not, Parmenides?' said Socrates.

'Because one and the same thing will exist as a whole at the same time in many separate individuals, and will therefore be in a state of separation from itself.'

'Nay, but the idea may be like the day which is one and the same in many places at once, and yet continuous with itself, in this way each idea may be one and the same in all at the same time.'

'I like your way, Socrates, of making one in many places at once. You mean to say, that if I were to spread out a sail and cover a number of men, there would be one whole including many — is not that your meaning?'

'I think so.'

'And would you say that the whole sail includes each man, or a part of it only, and different parts different men?'

'The latter.'

'Then, Socrates, the ideas themselves will be divisible, and things which participate in them will have a part of them only and not the whole idea existing in each of them?'

'That seems to follow.'[1]

Although this problem is not, strictly speaking, the logical problem, it can easily be assimilated to the latter. In trying to grasp the universal whole and explain it, Socrates falls back upon the sensible integral whole that the senses and imagination attain to. Although certainly not completely ignorant of the universal, Socrates is unable to resolve to the intellect, as he must do to judge properly of its nature. Instead, he falls back upon his senses and imagination, thus getting into all kinds of difficulties. This marvelous passage at once points out the difficulty and the necessity of resolving to the intellect in logic. We find the difficulty of Socrates in this passage in contemporary confusion of the universal with the class. The latter, a collective whole, can be attained by the imagination while the former is grasped only by the intellect.

The five universals or the five predicables lie at the foundation of logic, as Porphyry has so well shown in his *Isagoge*. We have already seen that a proper understanding of the *universal* in traditional logic requires resolution to the intellect. But we can see this more particularly when we enter into the details of the five predicables. One common way of failing to resolve to the intellect in logic is the confusion of the universal with the class. The class or collection, which is not said of the members it contains taken separately (as *crowd* is not said of any individual in it), can be attained by the imagination, but the universal as such, never. We can see in particular

1. *Dialogues of Plato*, Jowett Trans., Random House, N. Y., Vol. II, pp.91-92, n.131.

that the difference between genus and the ultimate species is destroyed when we conceive of them as classes rather than as universals. This can be seen in a couple of passages of St. Albert on the difference between the relation of the genus to the species and that of the species to the individuals:

Nec potest esse genus unius speciei contentivum: eo quod species non exit a genere, nisi per oppositas differentias divisivas: quae (cum eductae fuerint a genere) plures et oppositas constituent species de necessitate. Non sic autem se habet species ad individuum. Non enim species sui divisione constituit individuum, sed totum est in individuo per substantiam et potestatem: unde materiae determinatione ex accidente individuante individuatur.[1]

The other passage is the following:

Alia enim potestate genus est in specie una, et alia in alia: et non talis divisio est speciei per materiam: eadem enim potestate species est in uno individuo et in alio, nec est divisa, sed secundum esse integrum manente sua naturali potestate est in quolibet individuorum.[2]

Such radical and essential differences between the genus and the species (the *infima* species, of course) would be wholly ignored or misunderstood if we conceive of the genus as a collection of species and the species as a collection of individuals. In that case, the relation of genus to species and that of species to individuals would be roughly the same. It would make no sense to say that the genus constitutes the species by the division of itself, and not the species, similarly, the individuals. Or to say that the whole power of the species is in each individual, while the power of the genus is other in each species, or that the whole power of the genus is not realized in each species.

... individua in quibus omnibus est ipsa species secundum totum suum esse et secundum totam suam potestatem. Hoc autem modo ... non est genus in speciebus: in nulla enim species secundum se est genus secundum totum ambitum suae potestatis.[3]

Having given examples from the foundations of logic to illustrate a bit the crucial role of resolution to the intellect in that science, we can now turn to some examples from the principal parts of that science. Aristotle's *Prior Analytics* is especially important for illustrating our principle, not only because it considers so important a part of logic, but especially because this part is the place where, characteristically and most often, people in our day fail to resolve to the intellect.

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1. *De Praedicabilibus*, *op. cit.*, p.62*b*.
2. *Ibid.*, p.65*b*.
3. *Ibid.*, p.86*a*.

There is a great danger of resolving to the imagination when considering the syllogism. When this is done, the syllogism is considered as if it were a mathematical form. The language used even in traditional logic could be misunderstood in this mathematical sense. This is most easily seen when we consider the relation of the syllogism to demonstration and the dialectical syllogism. The *form* of the syllogism as studied in the *Prior Analytics* could be thought of as abstracted from and applicable to diverse matters (as the necessary in demonstration and the probable in dialectic) in much the same way as a mathematical form is abstracted from and applicable to wood or clay or some other sensible matter. When this is done, formal logic is thought to be the whole of logic; just as arithmetic and geometry are complete sciences in themselves although they can be applied to some sensible matter in a *scientia media*. The very language used in traditional formal logic could be misunderstood in this sense. Take, for example, the words of St. Albert in his commentary on the *Prior Analytics*:

> ... nos enim hic loquimur de syllogismo simplici et formali, qui abstrahitur ab omni materia et demonstrativa et dialectica et sophistica, et tantum consideratur in ipsa syllogismi simplicis forma.[1]

If this abstraction were assimilated to that found in mathematics (as it certainly would be if we were resolving to the imagination rather than to the intellect), then the application of this *form* would also be understood in a mathematical sense. Thus, when St. Albert says, taking about the form of the syllogism, that "materia cui illa forma primo applicabilis est, duplex est, scilicet necessaria et probabilis",[2] this application of the syllogistic form to necessary or probable matter would be like that made in a *scientia media* where a mathematical form is applied to sensible matter. Once this is accepted, it becomes merely *consistent* to conceive of formal logic as the whole of logic. This is, indeed, what many have done.

The traditional logicians, of course, did not consider the abstraction of the *Prior Analytics* to be like that of mathematics. They regarded demonstration and the dialectical syllogism as true *species* of the syllogism; just as the isosceles triangle and the equilateral one are true species of triangle, unlike the wooden and metal triangles which add accidental differences, not constituting species. St. Albert puts it thus:

> uterque enim, scilicet et qui demonstrat et qui consensus interrogat, syllogizant, et unus syllogismus simplex et formalis est demonstrativus et dialecticus, quamvis non sit una species materialis syllogismi in utroque

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1. *Op. cit.*, Bk. I, pp.45*b*-46*a*.
2. *Ibid.*, p.9*b*.

istorum, sed unum sunt in forma simplicis syllogismi, sicut *isosceles* et *isopleurus* sunt una figura, quamvis non sint unus triangulus ...[1]

But, to *see* that demonstration and dialectical syllogism are true *species* of the syllogism, we must first see that the differences which they add to the formal syllogism determine what is intrinsic to the nature or definition of the formal syllogism, for this is required in all species-making differences. But here, again, whoever understands the syllogism in imaginative terms must fail to grasp what the syllogism is in strictly logical terms which requires resolution to the intellect. And, unless we achieve this latter, we shall never see how the differences of demonstration and the dialectical syllogism determine the nature of syllogism intrinsically as, e.g., isosceles and equilateral clearly determine the nature of triangle.

Let us turn, then, to considering the problem of resolving to the intellect in the consideration of the formal syllogism and, afterwards, we can better consider its relation to the dialectical and demonstrative syllogisms. The figures of the formal syllogism seem to be, historically, a frequent occasion for the mistake of resolving to the imagination rather than to the intellect in logic. The word *figure* is prominent in mathematics, and it seems so tempting to consider logical figures quasi-mathematically. This is where the "fourth figure" enters in. Whoever posits a "fourth figure" for the syllogism is giving a certain sign that he is resolving to the imagination rather than to the intellect. Imaginatively speaking, one can of course arrange those three letters in these four ways, but this doesn't amount to there being four figures in the intellect as such. This becomes clear when we go back to the definition of the syllogism and investigate the nature of its two propositions in the light of that definition.

The definition of the syllogism makes quite explicit that the propositions or premises of the syllogism have the nature of causes with respect to the conclusion. In fact, this is inseparable from them considered as premises or propositions. But the major and the minor premises are not causes of the conclusion equally or in the same way. This is what makes the syllogism so much more difficult to understand than induction. In the latter, the singular instances by which we progress toward the universal conclusion are all equally causes of the conclusion or related to it in the same way. The inequality and the diverse causality of the premises is already contained in the principles of the syllogism — the *dici de omni* and the *dici de nullo*. The major premise or proposition has the aspect of a prior and more universal (*in causando*) cause of the conclusion while the minor premise has the aspect of a posterior or proximate cause with respect to the conclusion. There is a likeness here to the parts of a definition

1. *Comm. in Pr. Anal.*, Bk. I, *op. cit.*, pp.8*b*-9*a*.

which are also uneven, or not on the same level with respect to the *definitum*; i.e., which are not equally related to the thing defined. To make the likeness more explicit, we can compare the major premise with the genus and the minor premise with the difference. As the difference contracts the genus to this species, so the universal power of the major premise is applied through the minor premise to this conclusion. In the so-called fourth figure, however, the major premise does not have the aspect of a universal cause or of that from which the syllogistic movement proceeds.

When we examine the way Aristotle uses letters in the *Prior Analytics* (Bk. I, Chs. 4-6), we can see that he guards us against the possibility of resolving to the imagination in regard to the three figures. He uses nine letters rather than the three we usually employ. We tend to use the letters A, B, and C for the major, middle and minor terms respectively in *all* the figures. But, since the order of terms in universality is different in each figure, this order of letters and terms corresponds only to the first figure. If we wanted the order of letters to correspond to the order of terms in the second and third figures, we would have to use the letter *A* for the middle term in the second figure (*B* for the major and *C* for the minor) and *C* for the middle term in the third figure (*A* for the major and *B* for the minor). However, it is less confusing to take another set of three consecutive letters for the second figure and likewise for the third, as Aristotle does. Thus, doing in our alphabet what Aristotle did in his, we might take the letters *M*, *N*, and *O* for the *middle*, major and minor terms respectively in the second figure and *X*, *Y* and *Z* for the major, minor and *middle* terms respectively of the third figure. Aristotle is more careful than we are in the use of letters to guard us against the serious error of regarding them as symbols which can be manipulated in the imagination in four ways.

Let us return to the earlier problem of the relation of the formal syllogism to demonstration and the dialectical syllogism. Do the latter add differences that contract what is intrinsic to the definition of the syllogism? Since the conclusion of a syllogism is derived from the premises, we should examine these differences in regard to the premises. The Greek word Aristotle chose for *premise* has the original meaning of a *stretching forward.* In English, we speak of *reaching* a conclusion by our premises. Our reason stretches forward to the conclusion, or reaches it by means of the premises. This is why the instances from which we make an induction cannot be properly called premises: they do not enable our reason to stretch as far as the universal statement; the latter we merely assume after so many instances without an exception. If our mind stretches forward to the conclusion by the premises, then *to be placed before* the conclusion in our mind is *intrinsic* to the definition of premise. But we do not find the same kind of placing before in the demonstrative premise

and in the dialectical one. In dialectic, we place those statements that are accepted as probable before the conclusions that can be drawn from them. It is through our acceptance of their probability that they can be placed before other statements which can be reached through them (provided, of course, they are suitably disposed in figure and mood of the syllogism). But we place the demonstrative premise before its conclusion because the evident truth of the former already forces our mind to assent to it while the latter does not necessitate any such assent by itself. It is difficult to see how these radical differences could be considered accidental or not intrinsic to what a premise is. The premise in demonstration of itself or from the necessity of the thing stretches forward to the conclusion, while that in dialectic does so through our consent. St. Albert is well worth quoting on this point:

> Unde in hoc differt propositio demonstrativa a dialectica quoniam demonstrativa propositio est sumptio alterius partis contradictionis quaecumque est vera et necessaria: non enim interrogat respondentis consensum, sed ex ipsa rei veritate et necessitate sumat quasi concessam ille qui demonstrat. Dialectica vero propositio non sic sumi potest: quia non habet rei certitudinem, sed ex consensu procedit respondentis: et ideo dialectica propositio est cum interrogatione alterius partis contradictionis quomodocumque scilicet concedere velit respondens. Hujus autem vera causa est: quia necessitas in propositione non est ab homine, sed a re ipsa: probabilitas autem erit ab homine: probabile enim est, quod videtur omnibus aut pluribus aut maxime notis: et ideo in probabilibus oportet quod habeatur respondientis condisputantis nobiscum concensus.[1]

If we have essentially different kinds of premises, then we have true species of syllogism. But true species are to be considered in the same science. Hence there can be no question of making formal logic the whole of even the logic of the third act of reason.

Resolving to the imagination is an impediment that destroys logic. The current confusions of logic with mathematics and with grammar are constant reminders that this impediment is with us. So also are those textbooks of logic which teach the "fourth figure" or use circles in the explanation of the syllogism.

An understanding of the subject of logic and of the term to which its judgments resolve, enables us to appreciate the great difficulty of this science. It is only in a comparatively easy science as geometry or arithmetic (where the subject is well proportioned to us) that it seems in any way sufficient for the teacher to proceed by defining, dividing, enunciating obvious propositions and demonstrating. In other sciences, such as natural science and metaphysics, it is not sufficient for the teacher to propose or show to the student the definitions, demonstrations, etc., which make up that science. The student

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1. *Comm. in Pr. Anal.*, Bk. I, *op. cit.*, p.8.

can, of course, be given words to memorize, but this is not teaching — it is in fact worse than not teaching the student at all. The role of the teacher here should be above all to prepare the mind of the student for an eventual reception with understanding of those definitions, demonstrations, etc. This preparation requires that the teacher, after having himself mastered the definitions, demonstrations, etc., search carefully for the proper means of proportioning them to the minds of the students. This intellectual leading by the hand, or *manuductio* as it is called in Latin, will have to fit the subject of the science in question and the student's relation to that subject. It is our purpose now to consider the need for that intellectual leading by the hand in logic and to show something about how it might be carried out.

We are in need of being led by the hand in those things which are difficult for us. But logic has the greatest difficulty. "Logica habet maximam difficultatem" is the statement of one of the most famous of the traditional logicians. But St. Thomas always uses words in a precise fashion. Why then does he attribute the *greatest difficulty* to logic? Aristotle, the founder of logic, had written of two sources of difficulty in the sciences. In a famous passage in Bk. II of the *Metaphysics*,[1] he had distinguished the difficulty due to the weakness of our mind from that resulting from the weakness in being (and hence in knowability) of the object. Thus it is that both metaphysics and natural science are much more difficult than mathematics, but for different reasons. In the former case, the principal difficulty is in the weakness of our mind, which derives its knowledge from sensible things that are intelligible only in potency, and which cannot think without images, while the subjects of that science transcend the imagination and are in themselves most knowable or intelligible. In the case of natural science however, the principal difficulty is due to the deficient manner of being or existing of such things as matter, motion and time which are involved in all natural things. But the subjects of mathematics are abstracted from matter, motion and time, while they are proportioned to our mind and fall under our imagination in one way or another. Logic, however, seems to share in both kinds of difficulty. Logic has something of the difficulty of metaphysics in that logic must resolve to the intellect and avoid being led astray by the imagination. But it also shares in the difficulty due to the weakness in being of its subject. Even real relations are so weak in being that many men, among the moderns as well as the ancients, think that they are only beings of reason. But the relations of logic, second intentions, have even less being than real relations. Hence, the difficulty of knowing them on account of the weakness of their being is magnified.

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1. 993*a* 30 — 993*b* 11.

If logic has this double difficulty which is compounded by the fact that logic is to be taught to beginners in the intellectual life, then even more so than natural science or metaphysics will it require an intellectual leading by the hand. We shall next attempt to sketch something of the nature of the *manuductio* required in logic.

One of the most important texts for a general understanding of *manuductio* is the following from the *Prima Pars*:

> Ducit autem magister discipulum ex praecognitis in cognitionem ignotorum, dupliciter. Primo quidem, proponendo ei aliqua auxilia vel instrumenta, quibus intellectus eius utatur ad scientiam acquirendam: puta cum proponit ei aliquas propositiones minus universales, quas tamen ex praecognitis discipulus diiudicare potest; vel cum proponit ei aliqua sensibilia exempla, vel similia, vel opposita, vel aliqua huiusmodi ex quibus intellectus addiscentis manuducitur in cognitionem veritatis ignotae.

We shall now exemplify the application of this doctrine to the teaching of logic.

Geometry, which involves imagination and can be learned in some way even by boys, can serve well to lead us by the hand through *examples* to an understanding of the doctrine on demonstration in the *Posterior Analytics*, as Aristotle's choice of examples there shows us. Rhetoric can in many ways dispose our mind to understand dialectic which is less known to us. This is because of the *likeness* of one to the other. Both are capable of arguing on opposite sides of a question; and our experience of the utility of this in the courtroom or in political life prepares us to see the same in the universal questions of dialectical discussion. There is some *likeness* of rhetorical *places* to those *places* that give their name to Aristotle's treatise on dialectic (the *Topics*). The art of cross-examination in the courtroom is very much like what Socrates was trying to do with dialectic. One can be led to state the principles of the categorical syllogism — the *dici de omni* and the *dici de nullo* — by the *opposite* cases of example and induction and the enthymeme which are closer to sense and our daily experience. When we ask the student why these latter forms do not conclude of necessity, he comes up with what they lack and would require in order to conclude necessarily. In this way, the student of logic is led by the hand to the principles of a form of argument whose conclusion follows necessarily. There are abundant possibilities for *manuductio* through *similia* between the parts of logic concerning the simple and the complex unknown. For example: just as one cannot prove every proposition from previous ones, so one cannot define everything; hence, the necessity of immediate propositions is analogous to the necessity of the predicaments (the categories of Aristotle).

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1. *Ia*, q. 117, a.1, c.

We have not yet touched upon what are perhaps the most important means or tools of *manuductio* in logic. One can be led by the hand to a second intention *by the analogy of a word* which applies to something close to the senses to begin with, and which has been later applied to a second intention because of a certain likeness of it to the original sensible thing. Thus, Porphyry, in his *Isagoge*, leads us to the second intentions of genus and species through the sensible impositions of these words. This kind of tool is usually ignored today. Sometimes one can be led to the second intention *through the act of reason* which founds it. We have made use of this tool in the present article. We can, of course, use the analogy of the word for getting at the acts which are usually named from sensible acts, such as grasping, dividing, showing, etc. Finally, one can be led to an understanding of a speculative act of the reason through a corresponding act in the practical reason, as when an analysis of counsel illuminates us about dialectical reasoning.

Lack of *manuductio* in the teaching of logic is so general that it is found even in those who would be described as traditional logicians. This great impediment to the whole of logic dates from the late scholastics. Of course in practice, it is very hard to teach a logic course with the proper *manuductio* in one semester to students who have not had grammar, rhetoric, geometry, etc., in a sufficiently rigorous way.

The most common impediment to the order of determination in logic consists in neglecting the first act of reason and its fundamental place in the whole of logic. This has become common-place since the rise and dominance of kinds of knowledge in which there is never achieved definitions of things, but only symbols, syndromes and other such concepts as are justified only by their consequences. This impediment combines with the impediment to judgment in logic which must resolve all the way back to the predicables.

We have attempted in this article to enumerate in an orderly way some of the main impediments to traditional logic. These impediments prevent many from understanding traditional logic as the traditional logicians themselves understood it. The question of whether the traditional logicians understood the nature of logic well or sufficiently, is a question that can be suitably raised only after we know how they understood it. But the latter is impossible so long as we are under the influence of any of the above impediments.

In concluding, we would like to remind the reader that our consideration here has been only an *outline* which needs to be filled in. However, such a rough approximation as this may be useful in opening the door to a more thorough consideration. We should also like to acknowledge our debt to monsignor Maurice Dionne, of Laval University, for the seeds that developed into this article, although

the responsibility for the imperfect development of them must be laid at our door.

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